REMARKS

Claim 1 has been amended to place it in better form and claims 4-7, 20, 22 and 23 to avoid improper multiple dependency. In addition, non-elected claims 8-19 have been cancelled to advance the prosecution of the case. However, withdrawn claim 22 has been retained, so it can be rejoined if the elected claims are found allowable.

In the Office Action, the Examiner rejected claims 1-7, 20, 21, 23 and 24 under 35 U.S.C. §102(b) for being anticipated by, or in the alternative, for being obvious over JP-2002-235242 (JP'242), JP-2001-146641 (JP'641) or EP 1116752 (EP'752). The same claims were also rejected under 35 U.S.C. §103(a) for being obvious over JP-2001-295134 (JP'134). All the references were cited earlier by Applicants in an Information Disclosure Statement.

However, it is believed the claims are not anticipated by or obvious over the cited references for the reasons explained below. These arguments are based in part, on experimental evidence set forth in the attached Appendix A. This evidence will be submitted in a suitable Declaration in supplement to this Reply.

The present invention relates to polyketone fibers having a decreased variation in tensile strength which is a problem to be solved in a conventional polyketone fiber, and being remarkably excellent in dynamic properties and the fatigue resistance required for industrial material fibers in comparison with conventional fibers.

The cited references disclose that polyketone is an alternate copolymer of carbon monoxide and ethylene, and that a polyketone fiber having a high tensile strength and a high tensile elastic modulus can be produced by wet-spinning a polyketone solution prepared by dissolving polyketone into an aqueous solution containing a metal salt such as a zinc salt and a calcium salt.

However, a polyketone fiber produced by the method disclosed in the references has drawbacks such that the variation in the tensile strength is increased, the heat resistance deteriorates, fluffs are often formed during twisting and the fatigue resistance deteriorates (see page 4, line 37 to page 5, line 19 of the specification)

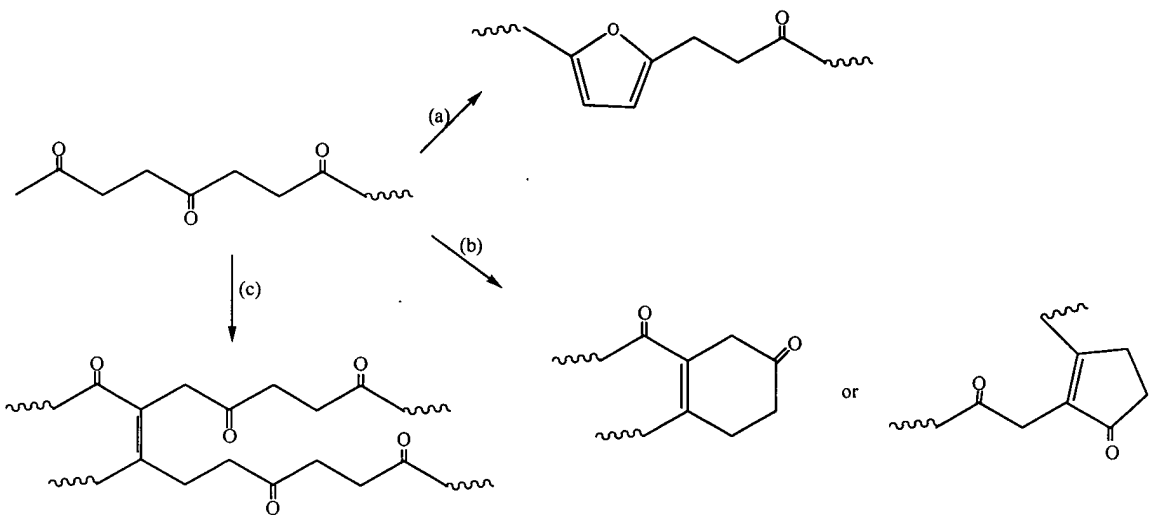
When a polyketone fiber is used in a tire cord where high safety is required, it is a fatal drawback when the variation in tensile strength is large, because, the fiber is partially very low in tensile strength, though the average tensile strength is high.

As a result of a diligent investigation to solve these technical problems, and in particular, the problem regarding the variation in tensile strength, the present inventors have found that the temperature and time during a dissolving step, a filtering step of the dissolved solution, a transportation step of the solution and an extruding step of the solution from an orifice have a great influence on the variation in the tensile strength, the heat resistance, the formation of fluffs during twisting and the fatigue resistance of the fiber.

Also, the present inventors have found that, when the temperature is high or the time in residence during the above steps is long at a low temperature, polyketone undergoes a chemical change and slightly deteriorates. This slight deterioration has a bad influence on the fiber's properties, as mentioned below.

As noted above, polyketone is dissolved in an aqueous solution containing a metal salt. When the temperature is higher or the time is longer during the dissolved state of the polyketone, a larger amount of the chemically changed products of polyketone is produced, as shown in Fig. 1 below.

Fig. 1



(a) : Formation of furan ring according to Paal-Knorr reaction;

(b) : Formation of intramolecular cross linking according to aldol condensation reaction;

(c) : Formation of intermolecular cross linking according to aldol condensation reaction.

The amount of the above chemically changed products of polyketone can be indicated by a minimum value of ultra violet absorbance spectrum at 210 to 240 nm, and when the minimum value is larger, the amount of the above chemically changed products of polyketone is larger.

In the present invention, a polyketone fiber is produced by a method in which polyketone is dissolved into an aqueous solution containing a zinc salt and the other metal salt, and the obtained polyketone solution is wet-spun while adjusting the temperature and time so that an S value is 1 or less during the dissolving step, the filtering step, the transportation step and the extruding step of the solution from an orifice, while controlling the minimum value (A_{min} (S)) of ultra violet absorbance

spectrum at 210 to 240 nm to 0.5 or less. As a result, the obtained polyketone fiber has a smaller variation in tensile strength.

Moreover, the present inventors have accomplished the present invention as a result of finding the following matters: there is a very close mutual relation between "a minimum value (A_{min} (F)) of ultra violet absorbance spectrum at 210 to 240 nm in a polyketone powder obtained from the solution just after extrusion" and "a variation in the tensile strength, the heat resistance, fluff formation during twisting and the fatigue resistance in a polyketone fiber".

The polyketone fiber of the present invention has a minimum value (A_{min} (F)) of ultra violet absorbance spectrum at 210 to 240 nm of 0.5 or less, and is remarkably improved in the variation in tensile strength in comparison with conventional polyketone fibers, and moreover, in the fluff formation during twisting and in fatigue resistance, as shown in the following Table 1.

Table 1

Drawing at high strain rate	Example 1	C. Example 1
A_{min} (F)	0.24	0.63
Variation in tensile strength	0.20	0.44
Fluff formation in twisted yarn (number/100 m)	0	3
Fatigue resistance (tensile strength retention) (%)	60	45

(Note)

Variation in tensile strength: When the value is smaller, the variation is smaller.

Fatigue resistance (tensile strength retention) : When the value is larger, the fatigue resistance is better.

The data in Example 1 can be found in Table 2 on page 69 of the specification and in C. Example 1 in Table 4 on page 71.

The polyketone fiber of the present invention satisfies the following feature as set forth in claim 1. It has a minimum value (A_{min} (F)) of ultra violet absorbance spectrum at 210 to 240 nm of 0.5 or less. When the polyketone fiber satisfies this feature, the polyketone fiber is remarkably improved in the variation in tensile strength in comparison with conventional polyketone fibers, and moreover, in fluff formation during twisting and in fatigue resistance.

JP'242 and JP'134 disclose a polyketone fiber having a tensile strength of 12 cN/dtex or more and a tensile elastic modulus of 250 cN/dtex or more obtained from an alternate copolymer of carbon monoxide and ethylene.

JP'641 discloses a method for producing a polyketone fiber by dissolving polyketone alternately copolymerized with carbon monoxide and ethylene into an aqueous solution containing a zinc salt or a zinc salt and at least one other metal salt.

EP'752 discloses a polyketone solution obtained by dissolving polyketone alternately copolymerized with carbon monoxide and ethylene into an aqueous solution containing at least one metal salt selected from a zinc salt, a calcium salt, a salt of thiocyanic acid and an iron salt, as pointed out by the Examiner.

However, the polyketone fiber of the present invention having a small variation in tensile strength cannot be obtained using the methods disclosed in these references, as explained above.

As discussed above, to obtain the polyketone fiber of the present invention, it is important to suppress the formation of furan ring according to Paal-Knorr reaction due to heating of the polyketone in a metal salt aqueous solution as the solvent, or the formation of chemically changed products such as intramolecular or intermolecular cross linking products according to aldol condensation reaction as shown in the above Fig. 1.

To suppress the formation of a slight amount of chemically changed products having an A_{min} (F) of 0.5 or less, it is necessary to adjust the temperature and time so that an S value is 1 or less during the dissolving step of polyketone and the following steps of extruding the obtained solution into a coagulation bath in which the polyketone is in contact with a metal salt aqueous solution (Condition-1), and as a result, to control A_{min} (S) to 0.5 or less (Condition-2). If one of the above conditions is not satisfied, a polyketone fiber having an A_{min} (F) of 0.5 or less cannot be obtained.

There is no disclosure in JP'242 regarding condition-1 of a dissolving condition (a temperature and a time) in order to produce a polyketone fiber. Regarding condition-1 and the temperature and the time during the defoaming step, the filtering step, the

transporting step, and the extruding step when producing a polyketone fiber, this reference only discloses an extruding temperature from a spinneret at 80°C. Also, there is no disclosure in the reference regarding condition-2 of A_{min} (S) as well as A_{min} (F).

There is no disclosure in JP'641 regarding condition-1 and the temperature and the time during the defoaming step, the filtering step, the transporting step and the extruding step from a spinneret when producing a polyketone fiber, and regarding condition-2 of A_{min} (S) as well as A_{min} (F).

There is no disclosure in EP'752 regarding condition-1 and the temperature and the time during the defoaming step, the filtering step, the transporting step and the extruding step from a spinneret when producing a polyketone fiber, and regarding condition-2 of A_{min} (S) as well as A_{min} (F). The reference only discloses the condition-I of a dissolving condition (a temperature and a time).

JP'134 discloses condition-1 of a dissolving condition (a temperature and a time) and of a filtering temperature and an extruding temperature from a spinneret at 80°C, but there is no disclosure regarding the time. Moreover, there is no disclosure in the reference regarding condition-2 of A_{min} (S) as well as A_{min} (F).

To prove that a polyketone fiber satisfying the A_{min} (F) value defined in claim 1 cannot be obtained by the disclosures of the references, the inventors conducted experiments of Example 1 of JP'242 (Experiment-I), Example 1 of JP'641 and JP'134 (Experiment-2) and Example 11 of EP'752 (Experiment-3). Table 2 below shows the producing conditions and Table 3 below shows the properties of the obtained drawn fiber in the experiments.

The data in Table 2 below under Example 1 can be found in Table 2 on page 69 of the specification. The data under Experiments-1, -2 and -3 can be found in Table 1 in Appendix A. The data have been placed in one table for easier comparison

The data in Table 3 below under Example 1 can be found in Table 2 on page 69 of the specification. The data under Experiments-1, -2 and -3 can be found in Table 2 in Appendix A. The data have been placed in one table for easier comparison.

As shown in Table 2 below, in Experiment-1, Experiment-2 and Experiment-3, the S value is more than 1 which is out of the scope of condition-1, and A_{min} (S) is more than 0.5 which is out of the scope of condition-2. Moreover, in the obtained drawn fibers, A_{min} (F) is more than 0.5 which is out of the scope of claim 1.

As shown in Table 3 below, in Experiment-1, Experiment-2 and Experiment-3, the obtained drawn fibers are remarkably large in the variation in tensile strength in comparison with that of the polyketone fiber obtained in Example 1 of the present invention. Moreover, the obtained drawn fibers are remarkably deteriorated in heat resistance, in fluff formation during twisting and in fatigue resistance.

It is clear then that the polyketone fiber of the present invention has excellent properties not enjoyed by those disclosed in the cited references.

In addition, there is no disclosure in EP'752 or JP'134 regarding the temperature and the time during the defoaming step, the filtering step, the transporting step and the extruding step from a spinneret, or regarding the relation between the above conditions and A_{min} (S) as well as A_{min} (F). The references only disclose the dissolving temperature and time.

Also, there is no disclosure in JP'242 or JP'641 even regarding the dissolving temperature and time.

Accordingly, for all of the above reasons, it is submitted that neither claim 1 nor claims 2-7, 20, 21, 23 and 24 dependent therefrom are anticipated by or obvious over any of the cited references. Their withdrawal as a ground of rejection of the claims under §102(b) and/or §103(a) is therefore requested.

It is believed claims 1-7, 20, 21, 23 and 24 are in condition for allowance. If so, it is requested that claim 22 be rejoined as provided by M.P.E.P. §821.04(a).

Table 2

	The present invention	JP'242	JP'641 & '134	EP'752
	Example 1	Experiment-1	Experiment-2	Experiment-3
Solvent Composition (wt. ratio)	$ZnCl_2/LiCl/CaCl_2/H_2O$ =22/10/30/38	$ZnCl_2/CaCl_2/H_2O$ =22/40/38	$ZnCl_2/NaCl/H_2O$ =65/10/25	$CaBr_2/H_2O$ =75/25
Polymer concentration (wt%)	7.5	7.5	8	10
Intrinsic viscosity [η] (d1/g)	5.5	5.6	5.6	4.1
Dissolving & defoaming conditions	50°C, 6 hrs	80°C, 2.5 hrs	80°C, 2 hrs	90°C, 1.5 hrs
Filtering step conditions	50°C, 30 min	80°C, 30 min	80°C, 30 min	90°C, 30 min
Heating step conditions	50 to 80°C, 30 min	80°C, 30 min	80°C, 30 min	90°C, 30 min
Extruding step conditions	80°C, 15 min	80°C, 15 min	80°C, 15 min	90°C, 15 min
S value	0.35 to 0.38	1.33 to 1.61	1.19 to 1.17	2.05 to 2.59
A_{min} (S)	0.20	0.57	0.70	0.66

Table 3

	The present invention	JP'242	JP'641 & '134	EP'752
	Example 1	Experiment-1	Experiment-2	Experiment-3
Drawing at high strain rate				
A_{min} (F)	0.24	0.60	0.78	0.69
Tensile strength (cN/dtex)	18.2	14.4	10.4	9.6
Tensile elastic modulus (cN/dtex)	433	310	320	250
Variation in tensile strength	0.20	0.46	0.65	0.58
Heat resistance % (tensile strength retention)	83	68	64	61
Fluff formation in twisted yarn (number/100 m)	0	2	12	20
Fatigue resistance % (tensile strength retention)	60	45	35	36

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: January 28, 2008

By: _____

Arthur S. Garrett
Reg. No. 20,338
Tel: 202-408-4091

Attachments: **Appendix A**